

Combinatorial Problems Raised by Statistical Mechanics  
February 19–23, 2007

# The lace expansion and the enumeration of self-avoiding walks

Gordon Slade

`slade@math.ubc.ca`

*Department of Mathematics  
University of British Columbia  
#121-1984 Mathematics Road  
Vancouver, BC V6T 1Z2  
CANADA*

## **Abstract**

The lace expansion is an elegant combinatorial construction that provides a recursion relation for the number of self-avoiding walks.

We first give an introduction to the lace expansion, and then explain how it has been used recently (*in joint work with Nathan Clisby and Richard Liang*) to enumerate self-avoiding walks on the hypercubic lattice up to  $n = 30$  steps in dimension 3, and up to  $n = 24$  steps in all dimensions above 3. Major improvements to the  $1/d$  expansion for the connective constant have also been obtained. In addition, an algorithmic improvement called the two-step method will be described.